

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



537952

(43) International Publication Date  
1 July 2004 (01.07.2004)

PCT

(10) International Publication Number  
WO 2004/055599 A1

(51) International Patent Classification<sup>7</sup>: G03F 9/00, 7/20,  
H01L 23/544, G01R 31/316

(74) Common Representative: KONINKLIJKE PHILIPS  
ELECTRONICS N.V.; c/o Waxler, Aaron, P.O. Box  
3001, Briarcliff Manor, NY 10510-8001 (US).

(21) International Application Number:  
PCT/IB2003/005645

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,  
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,  
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,  
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,  
MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT,  
RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,  
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 4 December 2003 (04.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/433,311 13 December 2002 (13.12.2002) US

(84) Designated States (*regional*): ARIPO patent (BW, GH,  
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,  
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*): KONIN-  
KLIJKE PHILIPS ELECTRONICS N.V. [NL/NL];  
Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

## Declaration under Rule 4.17:

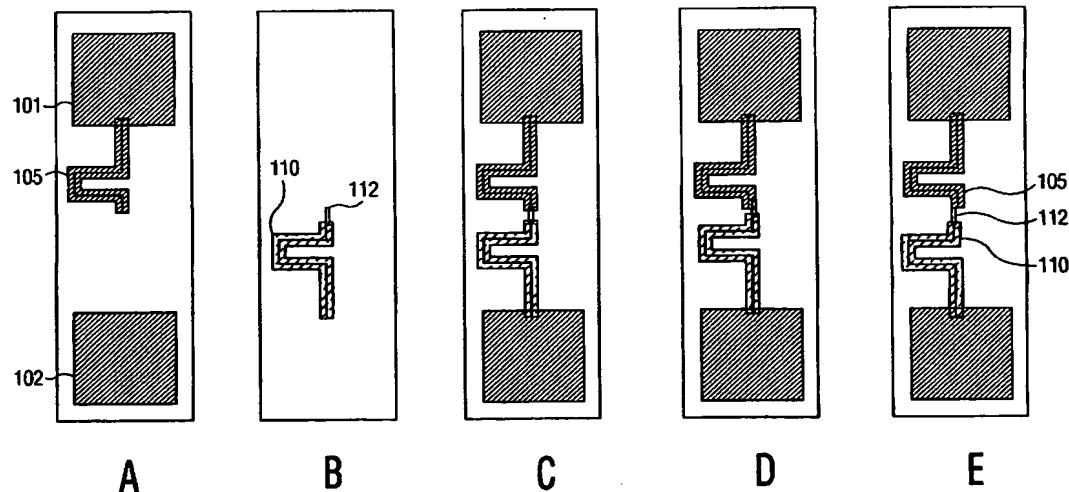
(72) Inventor; and

(75) Inventor/Applicant (*for US only*): AMATO, Joseph, M.  
[US/US]; P.O. Box 3001, Briarcliff Manor, NY 10510-  
8001 (US).

— as to applicant's entitlement to apply for and be granted  
a patent (Rule 4.17(ii)) for the following designations AE,  
AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH,  
CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES,

[Continued on next page]

(54) Title: RESISTOR STRUCTURES TO ELECTRICALLY MEASURE UNIDIRECTIONAL MISALIGNMENT OF STITCHED MASKS



(57) Abstract: An apparatus and method for matched variable resistor structures to electrically measure unidirectional misalignment of stitched masks for etched interconnect layers includes a first test pad (101) and a second test pad (102) for measuring resistance therebetween; a first resistive element (105) electrically connected at a first end to the first test pad (101); and, a second resistive element (110) electrically connected at a first end to the second test pad (102). The first resistive element and the second resistive element are electrically connected by a vertical offset (112). The resistance measured between the first test pad and the second test pad is variable in accordance with an alignment of the first resistive element and the second resistive element relative to the vertical offset, see Fig. 1C-E. An indicator may optionally provide an indication that the resistive elements are in alignment.



FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

**Published:**

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT 03/05645

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G03F9/00 G03F7/20 H01L23/544 G01R31/316

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G03F H01L G01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 225 013 B1 (AYELET MARGALIT ILOVICH ET AL) 1 May 2001 (2001-05-01) column 1, line 5-8 column 2, line 32-41 column 3, line 32-48 column 10, line 55 -column 11, line 12; claim 20; figures 2,3,15,16 ---	1-13
Y	US 6 393 714 B1 (LOOK KEVIN T ET AL) 28 May 2002 (2002-05-28) column 1, line 5-8 column 3, line 66 -column 5, line 3; figures 1A,1B,4B --- -/--	1-13

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

18 February 2004

Date of mailing of the international search report

01/03/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Prasse, T

## INTERNATIONAL SEARCH REPORT

International Publication No  
PCT/03/05645

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 571 538 A (CHOW PEI-MING D) 18 February 1986 (1986-02-18) column 1, line 8-12 column 2, line 36 -column 4, line 29; figures 1-4 -----	1-13
A	DE 38 31 086 C (TEXAS INSTRUMENTS DEUTSCHLAND GMBH) 8 February 1990 (1990-02-08) column 1, line 3-9 column 2, line 67 -column 4, line 42; figure 1 -----	1,4-6,9

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International

Application No

PCT/JP03/05645

03/05645

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6225013	B1	01-05-2001	US 6194105 B1 27-02-2001
US 6393714	B1	28-05-2002	WO 0163662 A2 30-08-2001
US 4571538	A	18-02-1986	NONE
DE 3831086	C	08-02-1990	DE 3831086 C1 08-02-1990